

Gov. Doe
O.U.T.

Submitted by the Ont. Road Builders
Assoc.

Ontario Transportation, Royal Commission



29

To The Chairman and Members
Royal Commission on Transportation,
Province of Ontario.

Gentlemen: Collection of misc. docs. No. 297

CHAS. N
37423 We have considered the Report of Annual Highway Costs, Province of Ontario,

made to the Railway Association of Canada by C.B. Breed, Clifford Older and Wm.S.
Downs.

In our view the above Report, so far at least as it pertains to the Province
of Ontario, is erroneous in the following particulars:-

The entire argument is based on their incorrect assumption that climatic
conditions are not the deciding factor in such design of pavements. The personnel
of the Ontario Highways Department have studied the effects of temperature changes
ranging from 30 degrees below zero in winter to 100 degrees in summer since the
real inception of road building in Ontario about 1918. We submit that the knowledge
and experience acquired in that period by a large staff of trained technical engineers
and experienced practical foremen and superintendents respecting local conditions
in Ontario should more than outweigh any information gained in a hurried trip of
2500 miles by the writers of the Report in less than two months throughout
the Province in the Fall of 1937.

The following quotations emphasize our contention that subsoil and climatic
conditions are the governing factors in design of pavements.

Exhibit "A". Paper prepared by R.M. Smith, Deputy Minister of Highways of
the Province of Ontario, and presented at the Annual Meeting of the Engineering
Institute of Canada in February 1932.

Exhibit "B". Statement presented on behalf of The Automotive Transport
Association of Ontario by M.J. Patton, Economist, to the Royal Commission on
Railways and Transportation at a public hearing in Ottawa, February 15th, 1932.
See Pages 11-13.

Exhibit "C". Extract from a paper by R.M. Smith entitled Highway Development
and Transportation, and presented to The Toronto Railway Club in 1932.

"Another criticism that I should like to answer is the claim that our highway
costs have been increased by reason of the operation of trucks and buses which, it
is alleged, has made it necessary to build to a standard higher than would be the
case were these vehicles not using our roads. This contention I emphatically deny.
The determining factor in road construction in this country is not nature of use but
climate. Even where there are no trucks and buses operating we would still have to
build the same type of roads we are building today to withstand temperature changes

and to Professor Jackson

which range from anywhere up to 100 degrees in the summer to 30 degrees below zero or even lower in the winter."

Exhibit "D". Extract from a paper by F. Lavis, Consulting Engineer, New York, entitled The Effect of Heavy Motor Vehicles on Highway Costs, see page 100.

Exhibit "E". Letter filed by the Ontario Roadbuilders' Association with the Commission is in agreement with the above statements that climatic and soil conditions in Ontario determine the thickness in design of pavements rather than loads imposed by heavy motor vehicles.

It has been repeated ad infinitum that a dry stable foundation is a 90% requisite of a properly designed road. The problem is to secure such foundation in most cases at a reasonable cost to permit of the design of a pavement in accordance with the formulae submitted in the Breed Report.

Exhibit "F". Extract of an article published in the Nerba, February 5th, 1938, entitled Drainage Practices in Massachusetts.

"The necessity for adequate highway drainage as a prime requisite in the construction of a highway has been recognized in Massachusetts from the earliest days. The first report of the Massachusetts Highway Commission, dated February 1893, states 'the first principle of scientific road building can be expressed in three words, - a dry foundation. Without a dry foundation, the labor of the roadmaster will be wasted, and the maximum cost with the minimum good will result.' Then as today, the most important function of highway drainage is to secure a dry foundation.

"This may in general, be accomplished in two ways, - either by roadside ditches to lower the water table or by an artificial foundation, adequately drained, and supplemented by side drains where necessary.

"From the beginning, roadside ditches have not been used by Massachusetts because of their hazard. We are fortunate in having plentiful and widespread deposits of gravel, and every road, except through gravel or sand country, is built on a foundation of gravel. This varies in thickness with the type of natural material encountered, but averages in the vicinity of 12 inches. This foundation is used regardless of the type of surfacing, as with the action of frost, a cement concrete pavement will heave and break up as inevitably as a low cost type if the foundation is not stable and dry.

"The gravel foundation must in turn be drained or it will only form a reservoir for water at low points. This is accomplished in a number of ways. The subgrade under the foundation is crowned, parallel to the crown of the surface. In fill sections the gravel layer is carried through the shoulder to the slope to allow the water to leach away and in addition, bleeders consisting of trenches filled with screened gravel stone, broken stone or sledged stone are constructed through the shoulders to the slope at all low points and at frequent intervals wherever there is an opportunity to outlet the water. Wherever catchbasins and drains are constructed to take care of surface water, water from the foundation is led into the catchbasin through openings in the catchbasin walls, made either by the omission of a few bricks or by the insertion of a short piece of clay pipe, just below subgrade level."

Exhibit "G". Department of Highways of Ontario - Cross-sections.

Despite such provisions as shown in these Cross-sections for securing insofar as possible ideal subgrade conditions the engineers of the Highway Department are more than ever of the opinion that in the final analysis the factor of safety requires that subsoil and climatic conditions govern the ultimate design of

thickness of pavements.

In 1929 concrete pavements designed by trained engineers according to the best modern practice at that time and constructed by competent contractors under rigid inspection were laid in a North Toronto suburban area during a real estate boom. The depression came and very little traffic, certainly no heavy truck or bus traffic, passed over the pavements; yet after several years numerous cracks were in evidence which must be attributed entirely to subsoil and climatic conditions, rather than to traffic use.

This is only one of many examples of a similar kind which might be noted. Subsoil and climatic conditions affecting the life of pavements must, we feel, take precedence in design over the effect of loads carried by heavy motor vehicles; at any rate until the science of soil mechanics has advanced to such a degree that it is possible to secure the ideal dry stable subgrade or sub-base at a cost which will warrant such construction and at the same time will insure the elimination of destructive frost action and the weakening of such foundations.

We take exception to the various statements and ideas respecting the design of pavements in the Breed, Older, Downs Report, among which are the following.

Exhibit "H". - Breed, Older, Downs Report, Page 48.

The general theory of wheel load distribution and the design of pavement thickness according to the developed formulae that such thickness varies as the square root of the wheel load, we believe to be sound and in accord with the best accepted thought today. With this theory we have no fault to find, but to assume that it is practically and economically possible to secure an absolutely perfect sub-base and lay thereon a pavement designed in accordance with the formulae quoted and ignore what experience has shown to be the most destructive agent viz. climatic changes and subsoil variations, then we must take direct issue with their conclusions. It is equivalent to building a perfect structure and placing it out on a mud flat when it is dry and apparently sound in dry weather, and take a chance that rain, snow, ice and frost will not weaken the foundation. Such a chance no practical highway engineer in Ontario would wish to contemplate.

Breed, Older, Downs Report, Page 53.

"The statement has been made that in the design of pavements, subsoil and climatic conditions (changes in temperature) control the pavement thickness, which is not true. It is equivalent to saying that wheel loads do not control thickness of pavements."

In a northern country such as Ontario, experience indicates that subsoil and

climatic conditions do govern the design; and this design demands a thickness which is more than sufficient to take care of the heavy loads imposed on the pavement from motor traffic.

Breed, Older, Downs Report, Page 54.

"Thickening of the pavement will not cure these defects."

Every reasonable and economic effort has always been made in Ontario to properly drain and strengthen the sub-base or subgrade, but the factor of safety still requires that adequate provision be made to take care of the enormous and uncertain power of frost.

Breed, Older, Downs Report, Page 55.

Re concrete sidewalks-

We submit that numerous cases can be cited in Toronto where concrete sidewalks have failed where no vehicular traffic has passed over at all. Such failure is due entirely to subsoil and climatic conditions. Until such time as dry stable foundations are assured extra depth of pavements and walks must be provided to take care of heaving frost action, the power of which is practically irresistible.

Moreover in view of past experience the Works Department of the City of Toronto has increased recently the depth of concrete walks from $4\frac{1}{2}$ inches to 5 inches and made the concrete mix stronger to take care of such climatic conditions.

Breed, Older, Downs Report, Page 59.

Re thickness at edge of pavement-

Department engineers state that the pavements were thickened at the edges on account of frost action and not by reason of heavy traffic.

Breed, Older, Downs Report, Page 67.

Re thin bituminous roads-

Roads such as these will not stand up under winter and spring conditions in Ontario but deteriorate very rapidly.

See paper presented by R.M. Smith, Deputy Minister of Highways, at the Canadian Engineering Institute meeting Toronto, February 5, 1932.

Breed, Older, Downs Report, Page 67.

"In addition, there are other elements of costs made necessary for the heavy trucks which have not yet been considered. These are the additional width of pavement, the additional lanes required when the mixed traffic becomes considerable, and the fact that the heavy vehicle has destroyed many of the pavements, which were previously designed adequate for the lighter truck and the basic vehicle."

The desire for increased safety and convenience of ordinary motor cars led to the construction of the more modern pavement with increased width of traffic lanes,

improved alignment, better gradients, and better visibility. Primarily the enormous increase in the number of passenger vehicles, and the increasing speed, and larger number of inexperienced drivers and the appalling list of accidents demanded new safety measures, hence the modern highways.

Heavy trucks in common with passenger cars share in all the advantages of the modern highway, but that is no reason to infer that their operations have necessitated such improvements or have been the main contributory reason for their adoption.

Breed, Older, Downs Report, Page 96.

"From a physical standpoint the truck and the bus are obviously the limiting vehicles in determining the minimum width of a traffic lane."

We submit that speed of passenger vehicles has determined the width of traffic lanes.

Breed, Older, Downs Report, Page 101.

"The increase in the amount of mixed traffic was no doubt a major cause for the progressive widening of traffic lanes in Ontario during the period under review in this report, and for the change from 2-lane to multiple lane roads. Had there been no trucks or buses in the traffic stream, an increase in volume of passenger car traffic alone would not fully warrant the widening of traffic lanes and the construction of wider and firmer shoulders."

We submit that the progressive widening of traffic lanes in Ontario was due to the increase in general traffic and to a great extent to the tourist traffic which in Ontario is very heavy in the summer season. Summer week-end traffic tie-ups, for example, on North Yonge Street from Steele's Corners north to Richmond Hill are certainly not caused by trucks and buses but by the large volume of passenger car traffic and lack of highway capacity.

Breed, Older, Downs Report, Page 102.

"When delays become excessive and congestion frequently occurs, additional lanes are required to relieve this situation. Motor trucks have a definite responsibility for this extra width since their excessive size and inherent slow operation will require additional lanes earlier than would be the case for passenger cars alone."

More often old cars with poor drivers and heavy tourist traffic cause congested highways and long delays rather than the operation of trucks and buses on the road.

Breed, Older, Downs Report, Page 103.

Re Three and Four Lane Roads-

Most accidents are caused on hills by cutting in and out of passenger cars.

The majority of trucks and buses can travel as fast or faster than most of the old cars which move on the highways and in addition a considerable movement of trucks takes place during the night when few passenger cars are travelling.

Breed, Older, Downs Report, Page 105.

"The heavier wheel loads, therefore, determine the life of the pavement."

We submit that the life of the pavement depends more on the condition of the subgrade particularly in the spring when truck loads in Ontario are reduced to one-half on account of weakened subgrades. Though the pavement would carry the load on a theoretical dry subgrade, there is danger of failure when the subgrade is soft and yielding due to the frost action. In the summer the subsoil conditions are improved and normal truck loads are therefore not detrimental.

Breed, Older, Downs Report, Page 105.

Re Nuisance, Delays and Hazards to Other Traffic-

We submit slow moving passenger cars are responsible for a very large share of the nuisance and delays on the highways and numerous inexperienced and careless drivers for the hazards to other traffic. Truck drivers are probably on the average more competent, courteous and careful than the ordinary driver because of the extra weight and size of their vehicles.

Exhibit "I".

The Effect of Pavement Widths Upon Accidents by Roger L. Morrison, Professor of Highway Engineering and Highway Transport, University of Michigan, presented at the Fourteenth Annual Meeting of the Highway Research Board in December 1934. The conclusion was reached in this paper that wider pavements are needed more because of passenger automobile accidents than because of truck and bus accidents.

In the Report by F. Lavis on The Effect of Heavy Motor Vehicles on Highway Costs (Exhibit "D") the following extracts bear out many of the contentions which we have cited as follows:

Widths of Pavements, Pages 88 to 90, and 112.

Speed, Page 90.

Accidents, Pages 90 and 91.

Traffic Density, Pages 91 and 92.

Traffic Lanes, Page 92.

All of which is respectfully submitted by

THE ONTARIO ROADBUILDERS' ASSOCIATION

Toronto, June 1938.

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INDEX TO EXHIBIT IX

TARIFFS

1. Ontario Association of Motor Coach Operators Joint Tariff.
2. Canadian-American Trailways, Limited.
3. Canadian Greyhound Lines, Limited.
4. Collacutt Coach Lines.
5. Colonial Coach Lines, Limited.
6. Gray Coach Lines, Limited.
7. Highway King Coach Lines, Limited.
8. Toronto Greyhound Lines, Limited.
9. Toronto Coach Lines Limited.
10. Danforth Bus Lines.
11. Erie Coach Lines, Limited.
12. Woodstock-Ingersoll Bus Service.
13. Stapley's Bus Line.
14. Springbank Drive Bus Service.
15. Marsh Transport Co.
16. DeLuxe Coach Lines.
17. McLelland Transport Co.
18. Walter E. Harrold.
19. Columbus Bus Line.
20. Tillsonburg-Ingersoll-London Bus Lines.

41